

Editorial

Special Issue: Current Developments in Pure and Applied Mathematics “Dedicated to Professor Yilmaz SIMSEK on the occasion of his 60th anniversary”

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Abstract



This paper is compiled and surveyed by drawing brief summaries derived from 50 articles, which are written on the topic of “Pure and Applied Mathematics” and published in the “Special Issue: Current Developments in Pure and Applied Mathematics” “Dedicated to Professor Yilmaz SIMSEK on the occasion of his 60th anniversary”.



Keywords: Pure and Applied Mathematics, Mathematics in general, General applied mathematics, Nonlinear Analysis, Global Analysis, Approximation Theory, Functional Analysis, Functional Equations, Inequalities.

2020 MSC: 00A05, 00A69.

The topics covered under the title “Current Developments in Pure and Applied Mathematics” play an important role in many branches of Mathematics, Statistics and allied areas such as Engineering, Computer Science, Physics and Mathematical Physics, Economics, and also other related areas. This Special Issue deals with the theory and applications of Pure and Applied Mathematics, especially the keywords for this special issue are *Pure and Applied Mathematics, Nonlinear Analysis, Global Analysis, Approximation Theory, Functional Analysis, Functional Equations, Inequalities and their Applications Real and Complex Analysis, Integral Equations and Integral Transforms, Higher Transcendental Functions and Their Applications, q-Series and q-Polynomials, Analytic Number Theory, p-adic Analysis and their applications, Polynomials Analytic and Geometric Inequalities, Probability and Statistics, Inventory Modeling and Optimization, Ordinary Differential Equations, Difference Equations, Partial Differential Equations, Fractional Differential Equations, Stochastic Differential Equations, Time-Scale Dynamic Equations, Related Topics on Differential Equations, Engineering, Computer Science, Physics and Mathematical Physics, Economics, and Other Related Areas.*

†Article ID: MTJPAM-D-24-000YS

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Received:26 December 2025, Accepted:29 December 2025, Published:30 December 2025

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This Special Issue is dedicated to Professor Yilmaz Simsek on the occasion of his 60th Birthday, in recognition of his significant contributions in many different areas of Pure and Applied Mathematics.

As a co-worker and collaborator, Professor Simsek is very kind, respectful, and genuinely helpful to almost everyone. Professor Simsek is featured in written documents and websites where he has made outstanding contributions to hundreds of people, as well as thousands of single-authored and co-authored scientific journal articles, and book Chapters. For this reason, issues of journals and special books have been dedicated to Professor Simsek so far.

We, as editors, are honored and delighted to contribute to the preparation of this Special Issue dedicated to Professor Simsek for its publication in the "Montes Taurus Journal of Pure and Applied Mathematics". We believe with our deepest feelings that, since our journal "Montes Taurus Journal of Pure and Applied Mathematics" aims to unite all scientists in the world and to "keep serving humanity" forever without compromising its scientific policy, not only this special issue. All of the other volumes of this journal will always serve all researchers dealing with scientific researches and endeavors.

1. Special Issue Information:

All manuscripts of this Special Issue in the Montes Taurus Journal of Pure and Applied Mathematics are dedicated to Professor Yilmaz Simsek on the occasion of his 60th Birthday. Yilmaz Simsek's scholarship, global impact, professional contributions, and many friendships and collaborations deserve celebrating! We, as editors, are appreciative to be able to write this article in Professor Yilmaz Simsek's honor. We are also honored to thank him most sincerely for his remarkably outstanding contributions to many different areas of Pure and Applied Mathematics.

This Special Issue aims to deal essentially with the theory and applications of the areas developed and advanced by **Professor Yilmaz Simsek** and his research collaborators. Especially, we invited high-quality original research papers, as well as survey papers related to the topics of this Special Issue for possible publication in this Special Issue.

As for the brief curriculum vitae of **Professor Yilmaz Simsek**:

Yilmaz Simsek was born on October 25, 1963 at Elazığ, Türkiye. After completing primary and secondary school in Elazığ, he attended high school in Adana. His Higher Educations are given as follows:

- B.Sc. Cukurova University (Adana-Türkiye)-1987,
- M.Sc. Cukurova University (Adana-Türkiye)-1990: (Hermitian Matrix Inequalities), and
- PhD. Cukurova University (Adana-Türkiye)-1993: (Generalized Dedekind and Hardy sums).

His Work Experience are given as follows:

- Çukurova University Meris Vocational School 1988 – 1993,
- Department of Mathematics, Faculty of Arts and Sciences, Mersin University 1993 – 2005, and
- Department of Mathematics, Faculty of Science, University of Akdeniz since 2005.

His Awards are given as follows:

- Science Award, Akdeniz University Science Antalya Türkiye, Service and Encouragement Awards, November 2011.
- Jangjeon Mathematical Society award 2017, Korea
- Ranking of scientists in Turkish Institutions according to their Google Scholar Citations public profiles.

His Current Research Interests are Real and Complex Analysis and their applications, Analytic Number Theory and its applications, Modular Forms, Elliptic Functions, p -adic Analysis and their applications, Generating Functions and their applications, Special numbers, Special Polynomials, Special Functions, Integral Equations and Transforms, q -Series and q -Analysis, Modular form and Elliptic functions associated with Dedekind sums and Hardy Sums, the finite sums, Families of Zeta type functions, Dirichlet series, and Lambert-type series, Umbral Algebra and Umbral Analysis and their applications, Combinatorial Analysis and their applications, Probability Distribution functions

and their Applications, Computational Science and Engineering, Computational Algorithms, Algebra of the Lyndon words, Linear Algebra and their applications, Generating functions and special functions associated with Superoscillations, and etc.

He founded the following International journal:

- Montes Taurus Journal of Pure and Applied Mathematics (ISSN: 2687-4814),

which is available at the following website:

- <https://mtjpamjournal.com>.

He also founded the following conference and symposium series:

- Mediterranean International Conference of Pure & Applied Mathematics and Related Areas (MICOPAM), and
- Symposium on Generating Functions of Special Numbers and Polynomials and their Applications (GFSNP).

He has been invited to many scientific activities such as international conferences, seminars, visiting professor. He is referee and editor of many mathematical journals.

His work has received around 8240 citations in Google Scholar with h-index 49. He has memberships of Editorial Board of many international journals. His works contributed to many areas of mathematics, especially generating functions.

Over and above, Professor Simsek continues to work as a referee and editor in many different national and international journals. Professor Simsek has provided master's and doctoral degree advisory services to more than 30 students and continues to increase intensively. He provides trainings in many countries with the Erasmus exchange program and the Mevlana exchange program. As a Visiting Professor, Professor Simsek gives trainings and scientific studies in many countries.

More than 350 articles and many book chapters have been published, and he continues to work on these subjects either alone, either with students or with other international distinguished scientists. Professor Simsek has participated in more than 150 international symposiums and conferences and presented oral presentations in almost every part of the world and in most of the countries, despite the pandemic, he continues to intensify these oral presentations. In addition to these, Professor Simsek has organized many special workshops and has made very important contributions to many workshops and continues to do so. Professor Simsek has devoted his life to mathematics, and his only notable hobby is listening, studying mathematics or exploring new results. In this way, he has made it a philosophy of life that he is very peaceful and can do much more useful work for humanity. With this philosophy of mathematics, Professor Simsek gave his two precious and beloved daughters:

- Associate Professor Dr. Burcin Simsek (Probability, Statistics and Biostatistics and their applications in medicine and other sciences; <https://scholar.google.com/citations?user=u4EQHcUAAAAJ&hl=tr>)

and

- Dr. Buket Simsek (Probability, Statistics and Biostatistics and their applications in medicine and engineering; <https://scholar.google.com/citations?user=doTU7iMAAAAJ&hl=tr>)

who has also chosen him as a colleague in different fields. He gained very deep knowledge from these two precious daughters. It is worth mentioning that the source of these successes is the tremendous and unforgettable support of his precious wife, Saniye Simsek.

Professor Simsek sincerely believe that he will serve for many more years, and write more articles and books, thanks to the support and love of his family, whom he loves very much, the respect and support of his very valuable students, and all his distinguished friends around the world with whom Professor Simsek has collaborated and written articles. Further details about Professor Simsek's professional achievements and scholarly accomplishments, as well as honors, awards and distinctions, can be found at the following websites:

- <https://avesis.akdeniz.edu.tr/ysimsek>

and

- <https://scholar.google.com/citations?user=mKKkCFUAAAAJ&hl=tr>.

2. Special Issue Overview:

The Special Issue contains 50 contributions in Pure and Applied Mathematics. We now highlight the main results and motivations involving their abstracts of the following articles:

- In [1], a survey is presented on the author’s mean square and almost sure Whittaker–type derivative sampling theorems obtained for the class $L^\alpha(\Omega, \mathfrak{F}, \mathbf{P})$; $0 \leq \alpha \leq 2$ of stochastic processes having spectral representation, with the aid of the Weierstraß σ function. Processes of this class are represented by interpolation series. The results are valid for harmonizable and weakly stationary (or in the Hinčin sense stationary) processes ($\alpha = 2$) as well. The formulæ are interpreted in the α –mean and also almost sure sense when the input function and its derivatives are sampled at the points of the integer lattice \mathbb{Z}^2 . The circular truncation error is introduced and used in the truncation error analysis and related sampling sum convergence rates are shown.
- In [2], it was proved that if Ω is a non-empty set and X is a normed space, the normed space $c_0(\Omega, X)$ is barrelled, ultrabornological or unordered Baire-like if and only if X is, respectively, barrelled, ultrabornological or unordered Baire-like. If X is a metrizable locally convex space, and $\{\|\cdot\|_n \in \mathbb{N}\}$ is an increasing sequence of semi-norms defining its topology, $c_0(\Omega, X)$ is the metrizable locally convex space over the field \mathbb{K} (of the real or complex numbers) of all functions $f : \Omega \rightarrow X$ such that for each $\varepsilon > 0$ and $n \in \mathbb{N}$ the set $\{\omega \in \Omega : \|f(\omega)\|_n > \varepsilon\}$ is finite or empty, with the topology defined by the semi-norms $\|f\|_n = \sup\{\|f(\omega)\|_n : \omega \in \Omega\}$, $n \in \mathbb{N}$. Also, in [2], it was proved that the metrizable $c_0(\Omega, X)$ is quasi barrelled, barrelled, ultrabornological, bornological, unordered Baire-like, totally barrelled, and barrelled of class p if and only if X is, respectively, quasi barrelled, barrelled, ultrabornological, bornological, unordered Baire-like, totally barrelled, and barrelled of class p . Moreover, it was proved that the metrizable $c_0(\Omega, X)$ is baireled if and only if X is baireled. Two open problems are presented.
- In [3], the author first considers the new two-variables Fubini-type numbers and polynomials of the order r arising from the fermionic p -adic integral on $\underbrace{\mathbb{Z}_p \times \cdots \times \mathbb{Z}_p}_{r\text{-times}}$ and those degenerate versions. The author derives some interesting properties and recurrence relations on those numbers and polynomials. Second, the authors study the degenerate new two-variables Fubini-type numbers and polynomials of order r as one of the generalizations of these new two-variables Fubini-type numbers and polynomials by using the λ -Sheffer sequences. When $\lambda \rightarrow 0$, the author obtains interesting identities for those degenerate new two-variables Fubini-type numbers and polynomials of order r . Some of them include the degenerate and other special polynomials and numbers such as the degenerate Bernoulli polynomials and numbers of order s , the degenerate Euler polynomials and numbers of order s , the degenerate Frobenius–Euler polynomials of order r , the degenerate Lah–Bell polynomials, and so on.
- In [4], let $1 \leq p_i, q_i, r_i < \infty$, $s_i \in \mathbb{R}^+$ ($i = 1, \dots, d + 1$) and w_i, v_i ($i = 1, \dots, d + 1$) be weight functions on \mathbb{R} . Let $L_{s_i}(W)_{w_i, v_i}^{p_i, q_i, r_i}(\mathbb{R})$ ($i = 1, \dots, d + 1$) be weighted normed spaces of functions whose wavelet transforms are in Lorentz space. A bounded function $m(\xi_1, \dots, \xi_d)$ defined on \mathbb{R}^d is said to be a multilinear multiplier on \mathbb{R} of type $L(W)(p_i, q_i, r_i, w_i, v_i, s_i)$, if the multilinear operator B_m associated with the m

$$B_m(f_1, \dots, f_d)(x) = \int_{\mathbb{R}^d} \widehat{f}_1(\xi_1) \cdots \widehat{f}_d(\xi_d) m(\xi_1, \dots, \xi_d) e^{2\pi i(\xi_1 + \cdots + \xi_d, x)} d\xi_1 \cdots d\xi_d$$

defines a bounded multilinear operator from

$$L_{s_1}(W)_{w_1, v_1}^{p_1, q_1, r_1}(\mathbb{R}) \times \cdots \times L_{s_d}(W)_{w_d, v_d}^{p_d, q_d, r_d}(\mathbb{R}) \text{ into } L_{s_{d+1}}(W)_{w_{d+1}, v_{d+1}}^{p_{d+1}, q_{d+1}, r_{d+1}}(\mathbb{R}).$$

Also $BM[L(W)(p_i, q_i, r_i, w_i, v_i, s_i)]$ denotes the space of all multilinear multipliers of type $L(W)(p_i, q_i, r_i, w_i, v_i, s_i)$. In this work, the authors discuss the behaviour of the multilinear multipliers under the translation and modulation operators. Moreover, the authors give methods of construction examples of multilinear multipliers.

- In [5], this article is motivated essentially by the fact that, in the current literature, many different kinds of operators of fractional calculus (that is, fractional-order integrals and fractional-order derivatives) have been and continue to be successfully applied in the modeling and analysis of a considerably large number of applied scientific and real-world problems in the mathematical, physical, biological, engineering and statistical sciences, and indeed in other scientific disciplines as well. The author aims here at investigating a general family of hybrid-type fractional-order kinetic equations, which is associated with the Liouville-Caputo (LC) fractional derivative. The main results of [5] are sufficiently general in character and are capable of furnishing solutions of a remarkably large number of simpler fractional-order kinetic equations.
- In [6], the authors give generalization of Hardy's type inequalities by using the Green function and the Montgomery identity. The authors lean on the idea of the generalization of the Hardy inequality that includes measure spaces with positive σ -finite measures. The authors provide the result concerning the n -convexity property of the function and establish the connection between new and known result. In order to get upper bounds for the identities related to generalizations of the Hardy's inequality, the authors obtain Grüss and Ostrowski-type inequalities.
- In [7], the authors establish the 2-dissection and 4-dissection for Ramanujan-Selberg continued fraction and its reciprocal. The authors show an eight-terms expansion of the reciprocal of Ramanujan-Selberg continued fraction. In the end the authors give some remarks and suggest two open problems and conjectures on the dissections of the Ramanujan-Selberg continued fraction.
- In [8], motivated by the generalization of Taylor's series of $f(z)$ obtained by Osler (Taylor's series generalized for fractional derivatives and applications, *SIAM J. Math. Anal.* 2, 37–48, 1971), Tremblay and Fugère presented in 2007 a new expansion of an analytic function $f(z)$ in R in terms of a power series $\theta(t) = tq(t)$, where $q(t)$ is any regular function and t is equal to the quadratic function $[(z - z_1)(z - z_2)]$, $z_1 \neq z_2$, where z_1 and z_2 are two points in R (The use of fractional derivatives to expand analytical functions in terms of quadratic functions with applications to special functions, *Appl. Math. Comput.* 187 (1), 507–529, 2007).

To illustrate the concept, if $q(t) = 1$, the coefficient of $[(z - z_1)(z - z_2)]^n$ in the power series of the function $(z - z_1)^\alpha(z - z_2)^\beta f(z)$ is

$$D_{z_1-z_2}^{-\alpha+n}[f(z_1)(z_1 - z_2)^{\beta-n-1}(z_1 - z_2 + z - w)]|_{w=z_1}/\Gamma(1 - \alpha + n).$$

- In [9], let v be a valuation of a field K and $a = a_0, a_1, \dots, a_m$ be a complete distinguished chain for $a \in \bar{K} \setminus K$. Let v_a be the extension of the valuation v to the field $K(a)$. In this study some properties provided by distinguished pairs and lifting polynomials used to define a residual algebraic free extension of v to the rational function field $K(x)$ are obtained. The value group and residue field of the valuation v_a are written with the help of constants $\delta_K(a_i)$ and minimal polynomials of the elements in the chain. In addition to the relations between value groups and residue fields of the valuations $v_{a_i b_i}$ of the fields $K(a_i, b_i)$ are studied by considering two chains $a = a_0, a_1, \dots, a_m$ and $b = b_0, b_1, \dots, b_m$.
- In [10], the authors investigate some new classes of exponentially harmonic general variational inequalities. It is shown that the optimality conditions of differentiability exponentially general harmonic convex functions can be characterized by exponentially harmonic general variational inequalities. Some special cases are derived as applications. Several hybrid proximal point methods are suggested using the auxiliary principle technique. It is shown that the convergence of the proposed method only needs pseudo monotonicity of the operator, which is a weaker condition than monotonicity. It is an open problem to explore the applications in different branches of pure and applied sciences.
- In [11], the author introduce a novel type of generalized complex Szász-Kantorovich operators. Subsequently, the authors establish quantitative estimates within Voronovskaja's theorem, determining precise orders for approximating analytic functions. Notably, approach of [11] eliminates the need for imposing exponential growth conditions on compact disks when considering these operators.

- In [12], the significance of the (i, j, k) -variants of atom-bond connectivity (ABC) indices lies in the fact that their special privilege, for suitably-picked potential gains of the variants i, j and k , concur with a long shot a large portion of as of late considered atom-bond accessibility-related indices. In this paper, the authors obtain some mathematical inequalities based on the sign of the variants (i, j, k) in terms of degree, order and size, characterizations, and within comparisons, along with some bounds in terms of existing descriptors.
- In [13], Fibonacci numbers have mathematical properties and numerous applications in many fields of science. In this article, a generalization of the Fibonacci numbers is used as a member of the family of Fibonacci numbers namely k -Fibonacci numbers. Graph Theory is another highly useful area of applied mathematics such as transportation networks, electrical circuits, computer networks, chemistry, physics, social sciences, etc. k -Fibonacci graphs are defined as graphs with n consecutive degrees. The Omega invariant is used to learn more about k -Fibonacci numbers and graphs. The authors provide necessary and sufficient conditions for the realization of a set D of n consecutive k -Fibonacci numbers for each n . In addition, for $1 \leq n \leq 4$, the authors provide a list of all probable realizations known as k -Fibonacci graphs.
- In [14], the authors first introduce the r -associated λ -Lah-number and the r -associated λ -Lah-Bell polynomials, and to derive their recurrence relations. Second, the authors introduce the r -associated λ -Stirling number of the first and second kind, respectively. The authors also derive their recurrence relations and some interesting properties of these numbers. Specially, the authors consider the r -associated λ -Bell in terms of the r -associated λ -Stirling number of the second kind polynomials and to derive certain identities.
- The study of convolution sums of restricted divisor functions requires more complex computations because the coefficients in the cusp form or the new form are used. In [15], the authors introduce the inverse divisor function as a tool to give relatively simple formulae for restricted divisor functions using the Dirichlet convolution and show its values in simple cases. The basic properties of the arithmetic functions needed to obtain the main results are introduced.
- In [16], the objective of this paper is to build generating functions for new families of special numbers and polynomials, which are called higher order degenerate Peters-type Simsek numbers and polynomials of the second kind. Using generating function methods, the author gives both some fundamental properties of these functions with some relations among the higher order degenerate Peters-type Simsek numbers and polynomials of the second kind, the Stirling numbers of the first kind, the higher order degenerate Changhee numbers and polynomials, and the higher order Apostol-type Daehee numbers and polynomials. The author also gives some plots of these numbers and polynomials via Wolfram Cloud. Further, applying a partial derivative operator to these generating functions, the author obtains derivative formulas for these new families. Eventually, the author presents further remarks on new families of [16] including their generating functions.
- In [17], with aid of analytic techniques, the authors establish several harmonic mean inequalities for generalized hyperbolic functions. These inequalities generalize known results.
- In [18], since their introduction in 1972, the Srivastava polynomials and their extensions have undergone extensive investigation and diverse applications. This paper aims to establish various families of bilateral and mixed multilateral generating relations concerning the extended bivariate Srivastava type polynomials and arbitrary sequences of polynomials or functions. The outcomes presented herein, characterized by their generality, are poised to yield numerous generating relations encompassing established polynomials and sequences of functions, supplemented by several explicit demonstrations.
- In [19], the essential target of this study is to introduce multivariable and multiparameter generalization of the Hermite-based Peters-type Simsek numbers and polynomials and to construct their generating functions. Besides, inspired by the generating functions and techniques constructed by Simsek [applications of newly constructed families of generating-type functions interpolating both new and known classes of polynomials and numbers are investigated, as presented in Mathematical Methods in the Applied Sciences, Vol. 44, No. 14 (2021), pp. 11245–11268], the author here introduces and systematically investigates some new families of generating-type functions whose functional equations have been used to reveal generating functions for new

families of special numbers and polynomials in this paper. The constructed generating functions unify and generalize, but are not limited to, the generating functions for the Hermite-based Peters-type Simsek numbers and polynomials, the positive and negative higher-order Peters-type Simsek numbers and polynomials, the Peters-type Simsek numbers and polynomials of all kinds, the two-variable Peters-type Simsek polynomials, the two-variable Changhee polynomials. The author finalizes this paper by putting forward some comments involving open problems and observations on the main results.

- In [20], the behaviour of some of the physico-chemical properties of anti-Parkinson’s disease drugs are statistically analysed which are targeted to reduce the effects of the severe symptoms especially body shaking. In this paper, the QSPR analysis of topological indices on various drugs are discussed and also shown that the topological indices are highly correlated with the physical and chemical properties of anti-Parkinson’s drugs. The analysis might provide the details for chemical and pharmaceutical industry to obtain the significance details through quantitative methods rather than practically experimenting it.
- In [21], orthogonal polynomials related to the weight function

$$w^{(\alpha)}(x) = \frac{(1 - x^2)^\alpha}{\pi^2 + 4 \operatorname{arctanh}^2 x} \quad (\alpha \geq -1)$$

on $(-1, 1)$, as well as the corresponding quadrature formulas of Gaussian type, are considered. For some particular values of the parameter α , the coefficients in the three-term recurrence relation for these orthogonal polynomials are obtained in an explicit form as fractions. Numerical examples are included. The case $\alpha = -1$ can be connected with one Ramanujan integral recently considered by Gautschi and Milovanović [Math. Comp. 93 (347), 1297–1308, 2024].

- In [22], the authors decompose the palindrome composition set of the positive integer to construct an efficient algorithm for obtaining elements. The authors also develop techniques to investigate generating functions for the numbers of color palindrome compositions with respect to some coloring rules. Then the authors investigate the generating function, recurrence relations, and Binet formula for the n -color palindrome compositions, and so the authors see that the sequence of integers corresponding to the n -color palindrome compositions is the combination of even Fibonacci numbers and odd Lucas numbers. The authors also determine the relationships among color palindrome compositions, and the Fibonacci numbers. Moreover, by using decompositions and algorithms, the authors make patterns of some color palindrome compositions.

- In [23], for a natural number N , let $E(N) := \sum_{d \equiv 1 \pmod{3}}^{d|N} 1 - \sum_{d \equiv -1 \pmod{3}}^{d|N} 1$ and $\lambda(N) := E(N) - 3E\left(\frac{N}{3}\right)$. The formula

for convolution sums $\sum_{t=1}^{N-1} \lambda(t)\lambda(N-t)$ is very well known. In this article, $\sum_{\substack{t=1 \\ \gcd(t, N-t)=1}}^{N-1} \lambda(t)\lambda(N-t)$ is calculated using

arithmetical inverse of λ defined by Dirichlet convolution. Furthermore, the authors define the homogeneous Dirichlet convolution sum of arithmetical functions and find formulas of the homogeneous Dirichlet convolution sums of the inverse divisor functions.

- In [24], the objective of this study is to examine the impact of functional income distribution on aggregate demand in Türkiye between 1988 and 2023, employing the Post-Keynesian model as a theoretical framework. This is done by estimating the marginal effect of the profit share on each of the components of aggregate demand (consumption, investment, exports and imports). In this study, the ARDL bounds test method is used as the econometric method, and to ensure the reliability of the results, the Zivot and Andrews unit root test (E. Zivot and D. W. K. Andrews, Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis, *J. Bus. Econom. Statist.* 10, 251–270, 1992) and the Fourier-ADF unit root test, proposed by Enders and Lee (W. Enders and J. Lee, The flexible Fourier form and Dickey–Fuller type unit root tests, *Econ. Lett.* 117 (1), 196–199, 2012), are used in addition to the ADF unit root test. The results indicate that the demand regime in Türkiye is profit driven in the period 1988–2023. The effect of the profit share on consumption is contractionary for aggregate demand, while its effect on net exports is positive for growth. In fact, since the effect of the profit share on net exports is more dominant than that on consumption, the demand regime for Türkiye is obtained

with a profit-led. This study makes an important contribution to the literature by including the impact of the pandemic in 2020 on Türkiye's demand regime.

- In [25], Painlevé differential equation (PVE) is a special class of second order differential equations. The PVEs are distinguished by their shortage of movable singularities, which means that the outcomes lack singularities that may be shifted by changing coordinates. This trait separates them from other general nonlinear differential equations which renders them integrated in a certain way. In this effort, the author considers a special PVE type III in a complex domain taking the formal

$$\xi \gamma(\xi) \frac{d^2 \gamma(\xi)}{d\xi^2} = \xi \left(\frac{d \gamma(\xi)}{d\xi} \right)^2 - \gamma(\xi) \frac{d \gamma(\xi)}{d\xi},$$

subject to the boundary condition

$$\left(\gamma(\xi) = \xi + \gamma_2 \xi^2 + O(\xi^3), |\gamma_n| \leq 1, n \geq 2, \xi \in \cup = \{\xi \in \mathbb{C} : |\xi| < 1\} \right).$$

The author aims to introduce and study the analytic solution, univalent solution and approximate solution of this class in view of the geometric function theory (GFT). Since the most important problem in GFT is the connections bound (coefficients bound), therefore, the author introduces a study of this problem regarding the suggested PVE.

- In [26], the main motive of this paper is to introduce the extension of generalized gamma and beta functions involving the seven-parameters Mittag-Leffler function and also the authors have discussed some particular cases of these functions. Later, the authors investigated crucial properties of the beta function including summation relations, integral representations, Mellin transform and differential formulas. Further, the authors have produced statistical applications of this beta function involving beta distribution, mean, variance, moment generating function, cumulative distribution and reliability function.
- In [27], solution uniqueness and existence of a class of psi-Caputo fractional differential equations with deviating arguments is the main subject of this paper. Furthermore, the authors illustrate the practical use of their result with multiple examples.
- In [28], the creation of a mathematical model for Alzheimer's disease using a set of fractional partial differential equations is discussed in this study. The dynamics of Alzheimer disease spread in a population can be explained by the mathematical model. Numerical solutions are obtained by using Newton's polynomial interpolation approach. A series of numerical simulations are presented to demonstrate the effectiveness of the proposed method.
- In [29], the authors study the harmonic numbers and their properties. Applying a method of generating functions and a composition operation, the authors get a series of identities that are related to the harmonic, central binomial, triangular, Catalan and Mersenne numbers. The authors find a new generating function for the sum of products of the harmonic numbers and inverse binomial coefficients. Its integral representation is written. In addition, the authors provide examples of calculating infinite sums and obtaining identities.
- In [30], the subject of this paper is the Cusa-Huygens inequalities. The authors analyse the Cusa-Huygens inequality on $(-\infty, +\infty)$ and some one-parameter Cusa-Huygens-type inequalities for all real values of the parameter on the interval $(0, \pi)$.
- In [31], let $\Psi^{(r)}(z)$ be the polygamma function of order $r \in \mathbb{N}$. In this paper, the author proves some inequalities for certain means involving the functions $\Psi^{(r)}(z)$ and $\Psi^{(r)}(1/z)$ for $z > 0$. The inequalities provide bounds in terms of the Riemann zeta function for harmonic, geometric and arithmetic means involving the functions $\Psi^{(r)}(z)$ and $\Psi^{(r)}(1/z)$. The techniques adopted in proving the results depend largely on monotonicity properties of some function involving the polygamma functions.

- In [32], boundary crossing problems of diffusion processes are of interest in many areas. For example, the Feller-Cox-Ingersoll-Ross model is used in neuroscience, in which a boundary crossing corresponds to the spiking of a neuron. In this paper, the authors study the problem of statistical inference for the unknown parameters of this model when only successive first passage times are observed. The probability density function of the first passage time is intractable, but through its Laplace transform, which is a ratio of confluent hypergeometric functions, the authors determine the identifiable parameter set, discuss the tail behavior of the probability density function and its partial derivatives, and propose a conditional version of maximum likelihood estimation.
- In [33], Schlömilch's integral equations are extensively used in the fields of terrestrial physics and ionospheric research. In recent years, numerous studies have focused on developing solution methods and exploring applications for these equations. In this work, the author defines, investigates, and proposes a solution method for Schlömilch-type integral equations. The author starts by classifying Schlömilch-type integral equations and developing a simple yet effective method for solving each class. Additionally, the author explores an application problem that leads to the Rayleigh equation and provide its solution. To demonstrate the efficiency and practicality of their findings, the author includes illustrative examples from the literature for each type of equation discussed.
- In [34], the sum-connectivity variant of atom-bond connectivity index is recently introduced, and is defined as the sum of the terms of the form $\sqrt{(d_u + d_v - 2)/(d_u + d_v)}$ over all adjacent vertices u, v in a graph G , and named as the atom-bond sum connectivity index denoted by $ABS(G)$. The sum of the absolute values of all the eigenvalues of the adjacency matrix of a graph G is known as the graph energy $E(G)$. In this paper, the authors observe some mathematical properties of $ABS(G)$ and establish bounds for this index in terms of other indices. The authors also compare $ABS(T)$ with $E(T)$ taking all trees T of order $n = 8, 9, \dots, 14$ and observe a very strong correlation between the two invariants for all studied groups of trees.
- In [35], the present survey investigates linear recurrences derived from sums of elements located on the transversals of some classical arithmetic triangles. The authors establish the corresponding linear recurrence relations, generating functions and deduce combinatorial identities. Finally, the authors provide the sums of the general term of the concerned linear recurrence sequences.
- In [36], the authors revisit the definitions of Hardy spaces of monogenic and discrete monogenic functions on octonionic right half-space. Due to the lack of associativity generalizations of Hardy spaces are considered in the framework of the weaker notion of para-linear functionals. The definition of appropriate Hardy spaces often requires the implementation of an additional octonionic intrinsic weight factor of unit length to ensure the property of having a reproducing kernel. The latter compensates the non-associativity. In the particular setting of considering the octonionic half-space consisting of all octonions having a positive real part however these weight factors disappear canonically.

First the authors re-interpret the previously introduced Cauchy transform within the recently established concept of \mathbb{O} -para-linear operators. The authors revisit the dual Cauchy transform within the setting of generalized adjoint operators of \mathbb{O} -para-linear inner products. This leads to a meaningful definition of a generalized octonionic Kerzman-Stein operator within the theory of \mathbb{O} -para-linear function spaces. Alike the complex and Clifford analytic case, also this octonionic version of Kerzman Stein operator produces in the special half-space case to the classical eight-dimensional Hilbert-Riesz transform. After having explained these peculiarities for the continuous case the authors discuss a Weyl calculus-based approach to discretize the octonionic Cauchy-Riemann operator. The authors round off by re-discussing Hardy spaces of discrete monogenic functions on octonionic half-space together with appropriate peculiar definitions of a discretized version of the octonionic Cauchy transform.

- In [37], the authors investigate a fixed point for a group of contractive mappings in the context of a complete b -multiplicative metric space. This research employs the Rus contraction to derive novel findings related to the complete b -multiplicative metric space. Furthermore, the authors establish a theorem on common fixed points for two mappings in complete b -multiplicative metric spaces. To validate their results, the authors provide several non-trivial examples.

- In [38], for any graph, the sum of the absolute values of the eigenvalues of the adjacency matrix is known as the energy of graph. In this paper, the authors find the spectrum and energy of vertex labeled complement of distinct graphs along with their bounds and extend it to three applications for the complements of some alkanes.
- In [39], the extended beta-type 1 distribution has the probability density function proportional to $u^{\eta-1}(1-u)^{\zeta-1} \exp\left[-\frac{\kappa}{u} - \frac{\tau}{(1-u)}\right]$, $0 < u < 1$. In this exploratory article, the exact forms of Rényi and Shannon entropies for the extended beta-type 1 distribution are discussed. Furthermore, the Fisher information matrix of the above-mentioned distribution is pointed out systematically.
- In [40], the authors explore the generalized partition functions $p_{[1^{\lambda_0} l^{k\lambda_1}]}(n)$ as defined by their generating functions

$$\sum_{n=0}^{\infty} p_{[1^{\lambda_0} l^{k\lambda_1}]}(n) q^n = \frac{q^{\frac{\lambda_0 + k\lambda_1}{24}}}{\eta(\tau)^{\lambda_0} \eta(k\tau)^{\lambda_1}},$$

where $\eta(\tau)$ is the Dedekind eta function, l prime number, k positive integer and λ_0, λ_1 arbitrary integers. The authors establish Ramanujan-type congruences for these partition functions $p_{[1^{\lambda_0} l^{k\lambda_1}]}(n)$ modulo powers of primes $l = 2, 3, 5, 7, 11, 13, 17$ for any integers λ_0 , and λ_1 . The results of [40] not only confirm but also extend the previous work of Atkin, Gordon, Wang, and others concerning congruences for various partition functions.

- In [41], entrepreneurship ventures in Micro, Small and Medium Enterprises (MSMEs) are the crucial components of India's economic growth and development. In 2020 - 2021 MSMEs has contributed almost 30% in India's GDP. MSMEs provide an essential platform to unemployed youths to venture in various small scale business opportunities using mostly the indigenous infrastructure and production models resources. By creating own MSME company a previously job seeker becomes a job giver to the other unemployed individuals. Unemployment is another important socioeconomic issue in India. After agriculture, MSME sector of India is the largest employment generator employing almost 15 million people all over the country. Therefore, by developing adequate entrepreneurship ventures in MSME sector the unemployment issue of India can be mitigated. The main objective of this article is to assimilate the dynamics of MSMEs to resolve the challenges of unemployment by creating jobs in new MSME entrepreneurship. For that purpose, the authors have proposed a deterministic mathematical model using nonlinear differential equations and analyzed it analytically as well as numerically. The model parameters have been estimated using real data set. The sensitivity analysis of the parameters has also been performed using PRCC method. It has been found that the rate at which an unemployed individual becomes an MSME entrepreneur with proper skills and training, the governmental schemes to financially support the MSMEs and the rate of generation of employment in MSME sector can significantly alter the system dynamics. Moreover, during COVID - 19 pandemic the rate of at which MSMEs were closed due to financial crisis & lockdowns and the rate at which MSME employees lost their jobs are also important regulators of the issue of unemployment. The results obtained through this study can be helpful to constitute the future financial policies related to the development of MSME sector of India.
- In [42], Kiris coastline, located in the west of Antalya, is one of the important tourism regions. Rocks of different ages and characteristics of the region are observed in the sediments of the coastline. The aim of the study is to determine the anomaly areas of Kiris beach sediments by calculating different indices such as contamination factor (C_f), degree of contamination (C_d), modified contamination degree (mC_d), pollution load index (PLI) and enrichment factor (EF). The beach sediments taken systematically along the beach were chemically analyzed by X-ray fluorescence spectroscopy (XRF). In this context, accumulation index degrees were determined in the study area and anomaly areas caused by natural and anthropogenic effects were determined.
- In [43], a three-compartment SIR epidemic model under vaccination coverage in both the vertically transmitted and non-transmitted newborns is considered and discussed local stability at both the equilibrium points and global stability at endemic equilibrium point. Also, analytical and numerical approaches were made in support of the results. It is observed that with the increase in the proportion of vaccination in the newborn, the infective populations almost vanish. Also observed that with the increase in the rate of infected newborns there is an increase in the infected individuals and with the increase in the vaccination to the infected newborn, there is an increase in the recovered individuals.

- In [44], a three-compartment SIRI epidemic model with reintroduced susceptibles under incorporated time delay on susceptible individuals is considered. Determined disease free, endemic equilibrium points and discussed local stability at endemic equilibrium point. Identified the point where the system stabilizes by means of Hopf bifurcation. Ascertained the results by numerical simulation using MATLAB. Observed that the system becomes unstable in both the cases of increase in the transmission rate and additional transaction rate respectively at a fixed critical time delay parameter using numerical examples.
- In mathematical chemistry, topological indices play a vital role. Most of the topological indices are defined on well known graph concepts such as degree of a vertex, distance, eccentricity of a vertex etc. Here the authors discuss degree based topological indices. In [45], the authors compute the forgotten index and the Zagreb index of degree based topological indices for splitting, shadow and total graphs.
- In [46], by finding the partial derivatives, the various convexity conditions such as the Schur, Schur geometric, and Schur harmonic convexities (concavities) of Muirhead mean are discussed by the authors. They gave not only new inequalities, but also strengthening the existing inequality chain by finding the Taylor's series expansions.
- In [47], the authors showed that many chemical molecules have acyclic structures when modeled by a graph. Most exceptions have hexagonal structure. Therefore, the study of hexagonal structures is rather useful and in this work, they studied one of the important and frequently used structure called as hexagonal chain systems. The authors of [47] calculated several degree based topological indices of these structures first for hexagonal chains, hexagonal double chains and hexagonal triple chains and finalized their calculations with the indices of hexagonal chain systems. They also calculated the numbers of faces of these systems by means of a recently introduced graph invariant called omega.
- In [48], based on $(p, q)^{\nu}$ -derivative and $(p, q)^{\nu}$ -integral, the authors prove some new Hermite-Hadamard type inequalities for functions related to quantum analog derivatives. The obtained inequalities generalize the corresponding inequalities in the literature.
- The article [49] focuses on several notions on minimal neutrosophic compact space. The authors of [49] introduce almost neutrosophic minimal compact space and nearly neutrosophic minimal compact space. The authors of [49] provide a suitable counter example in order to study the properties of almost neutrosophic minimal compact space. We investigate their basic properties and characterization theorems. The authors of [49] define countably neutrosophic m -compact space and investigate some of its basic properties and characterization theorems. We introduce the notion of neutrosophic m -Lindelöf space and investigate its basic properties and results. The authors of [49] further study the relationship of countably neutrosophic m -compact space with other known spaces.
- In the article [50], using the normalised Rabotnov functions and the concept of subordination related with Horadam polynomial, a new subclass of analytic bi-univalent function is introduced. Further, determining the Taylor-Maclaurin coefficients for the functions belonging to this subclass, the Fekete-Szegő inequality and Hankel determinant has been investigated.

Acknowledgements

This paper is dedicated to Professor Yilmaz Simsek on the occasion of his 60th birthday.

We extend our sincerest thanks to all the esteemed authors who contributed their work to this special issue. We also express our deepest gratitude to the reviewers who made these works possible in this special issue and who contributed with their valuable reports.

Author Contributions: All authors equally contributed.

Conflict of Interest: The authors declare no conflict of interest.

Funding (Financial Disclosure): There is no funding for this work.

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How to cite this article: A. Bayad, M. Alkan, I. Kucukoglu and O. Öneş, *Special Issue: Current Developments in Pure and Applied Mathematics “Dedicated to Professor Yilmaz SIMSEK on the occasion of his 60th anniversary”*, Montes Taurus J. Pure Appl. Math. **6 (3)**, i–xiii, 2024; Article ID: MTJPAM-D-24-000YS.